

- Polytrichum juniperinum*. St. Faith's Heath (Scarning Fen).
 ———— (*urnigerum*. Gillingham.)
Orthotrichum cupulatum. Trees, Lakenham.
 ———— (*Hutchinsia*. Ruins of the Garianonum, near Yarmouth.)
Anomodon viticulosum. Armeringhall Wood.
 ———— (*curtipendulum*. Fakenham Heath.)
Bryum argenteum. Walls and moist ground everywhere.
 ———— *nutans*. Hedge-banks: rather rare.
 ———— *roseum*. Mosswold, Bramerton.
 ———— *hornum*. Drummond's Grove, Thorpe, Lakenham.
 ———— *cuspidatum*. Drummond's Grove, moist lanes: frequent.
Buxbaumia aphylla. Sprowston, Sir W. J. Hooker.
Leucodon sciuroides. Lakenham, on trees and walls.
Daltonia heteromalla. Lakenham, on trees.
Fontinalis antipyretica. The Yare and Wensum.
Hypnum complanatum. Hawthorn fences.
 ———— *lutescens*. Bramerton.
 ———— *albicans*. Mosswold.
 ———— *alopecurum*. Armeringhall.
 ———— *proliferum*. Armeringhall, Lakenham Hall Wood.
 ———— *stellatum*. Bogs and marshes.
 ———— *triquetrum*. Heaths and woods: abundant.
 ———— *squarrosium*. Lanes and woods: frequent.
 ———— *palustre*. Marshes.
 ———— *scorpioides*. Marshes and bogs.
 ———— *molluscum*. Markshall, hedge-banks.
 ———— (*dendroides*. Fakenham.)

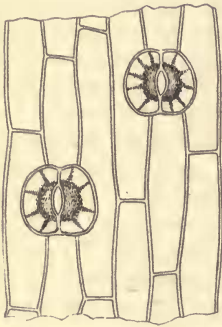
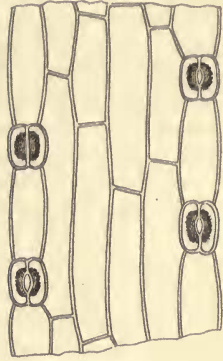
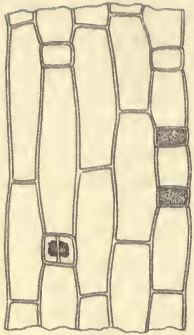
HEPATICÆ.

- Riccia crystallina*. Banks at Bixley and Armeringhall, turnip- and clover-fields: frequent.
Sphaerocarpus terrestris. Banks at Bixley and Armeringhall, turnip- and clover-fields: frequent.
Marchantia polymorpha, *conica*, *hemisphærica*. Walls and banks, river-side, &c.: frequent.
Jungermannia bicuspidata. Damp lanes and woods: frequent.
 ———— *complanata*, *dilatata*. Trees: frequent.
 ———— *connivens*. Bogs, among Bryums.
 ———— *pinguis*. Ditches and bogs: frequent.
 ———— (*asplenioides*, *tamarisci*. Ruins of the Garianonum, near Yarmouth.)

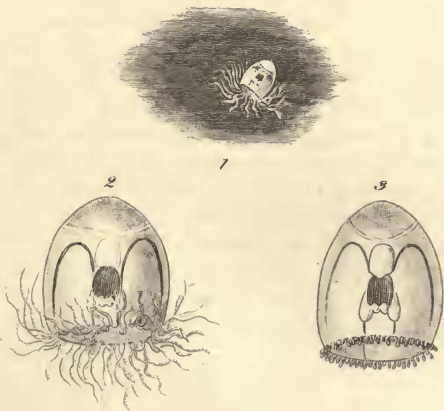
XXVIII.—On the Formation of the Stomata. By HUGO MOHL. (Linnæa, 1838, p. 544, with a Plate.)*

M. MIRBEL is the only person, so far as I know, who, in his memoir on *Marchantia polymorpha*, has published any

* From the translation in the Annales des Sciences Naturelles, April 1840, p. 222.



Development of Stomata.



Cyanea coccinea.



New Helix.



researches on the development of stomata. He has shown that they are developed in two different modes. First, there is found, in the epidermis, at the period of formation of a stoma, a little cavity, the bottom of which is occupied by an epidermal cell, which is surrounded by four other cells. By the absorption of this central cell the opening of the stoma is produced. This is the usual mode of development on the foliaceous expansions of the *Marchantia*. Upon the floral peduncles, on the contrary, the development generally takes place in an entirely different manner. The bottom of the cavity is formed by from three to five wedge-shaped cells, which touch each other at the centre, and which at a later period separate in such a manner as to show an opening in the form of a star. The cells always contract more towards the exterior, being transformed into an obturator ring, whilst the epidermal cells placed around form the margin of the stoma.

There is evidently a defect in this explanation of the development of the stomata, as it is not explained how the same form of stomata can originate in two such different ways. Indeed, in the first case, we cannot conceive how the porous cells, which constitutes what Mirbel calls the *anneau obturateur*, are formed. If the stoma is formed in consequence of the absorption of the epidermal cell, and the surrounding epidermal layers form the margin, the stoma would be formed only of a simple opening. This however is not met with in nature; for inwardly, at the margin, two or more cells (porous cells) are seen, which enclose the stoma itself. The origin of these porous cells is explained by the second manner of development described by Mirbel, but it is not in the first case.

I have endeavoured to solve the question by examining the *Marchantia polymorpha*, but I have not been successful, because in this plant the examination of the epidermis in its youngest state presents very great difficulties, as it can only be taken off by means of a scalpel, and does not therefore admit of being separated free from the subjacent parenchyma. In this way some of the subjacent parenchymatous cells are always removed with the epidermis, and prevent our recognizing with the necessary precision the slight changes which take place in the stomata at the moment of their production.

Respecting these researches, I shall confine myself therefore to merely stating, that I have seen the stomata originate on the frond of the *Marchantia* in the second mode pointed out by Mirbel, but I have not succeeded in seeing any stomata originate from the absorption of a cell.